

**Comparison of US Economy Input Price Growth
with Telephone Industry Input Price Growth**

	<u>Percent Change</u>	
	<u>US Economy</u> <u>Input Prices</u>	<u>Telephone Industry</u> <u>Input Prices</u>
1949	-1.0%	3.2%
1950	6.3%	5.1%
1951	7.9%	8.8%
1952	1.2%	8.6%
1953	3.7%	2.4%
1954	0.6%	1.9%
1955	6.6%	5.4%
1956	0.7%	1.7%
1957	3.7%	-1.1%
1958	0.5%	3.3%
1959	7.0%	5.4%
1960	-0.6%	4.2%
1961	3.6%	3.9%
1962	4.4%	2.2%
1963	3.8%	1.0%
1964	4.5%	6.0%
1965	5.7%	0.5%
1966	4.6%	1.1%
1967	2.0%	1.9%
1968	4.4%	4.2%
1969	3.7%	2.1%
1970	3.3%	3.8%
1971	6.8%	4.2%
1972	7.2%	8.0%
1973	6.3%	0.6%
1974	4.2%	5.9%
1975	9.4%	14.2%
1976	9.1%	10.7%
1977	8.6%	6.1%
1978	7.8%	7.6%
1979	8.2%	7.2%
1980	6.6%	14.6%
1981	9.9%	11.6%
1982	3.7%	12.1%
1983	5.6%	12.8%
1984	7.4%	1.8%
1985	4.0%	0.1%
1986	3.8%	1.3%
1987	3.1%	1.7%
1988	4.4%	-3.2%
1989	4.1%	-3.7%
1990	4.2%	11.9%
1991	2.9%	1.3%
1992	5.1%	4.4%
Average (1948 - 1992)	4.8%	4.7%

Note: Percent changes computed as logarithmic rate of growth.

**Statistical Test of the Hypothesis that
LEC Input Price Growth Equals
U.S. Economy Input Price Growth**

In order to determine if LEC input prices and U.S. economy input prices grow at the same rate, a t-test of this hypothesis was computed for three time periods: 1949-1992, 1949-1984, and 1985-1992. The values of the t-statistics and the critical values for the 95% confidence region are shown below:

<u>Time Period</u>	<u>T-Statistic</u>	<u>Critical Value</u>
1949-1992	-.08	2.02
1949-1984	.70	2.03
1985-1992	-1.67	2.31

Telephone Input Prices
1948-1979

L. R. Christensen, D. C. Christensen, and P. E. Schoech, "Total Factor Productivity in the Bell System, 1947-1979," Christensen Associates, Sept. 1981.

1979-1982

Bell Communications Research, Econometric Estimation of the Marginal Operating Cost of Interstate Access, May 1987.

1982-1984

L. R. Christensen, "Total Productivity Growth in the U.S. Telecommunications Industry and the U.S. Economy, 1951-1987," Schedule 3 to Direct Testimony, Case No. PU-2320-90-149, North Dakota Public Service Commission, 1990.

1984-1992

L. R. Christensen, P. E. Schoech, and M. E. Meitzen, "Productivity of the Local Operating Telephone Companies Subject to Price Cap Regulation, 1993 Update," Christensen Associates, January 1995.

U.S. Economy Input Prices
1948-1984

L. R. Christensen and D. W. Jorgenson, "U.S. Real Product and Real Factor Input, 1929-1967," Review of Income and Wealth, Series 16, March 1978, updated September 1986.

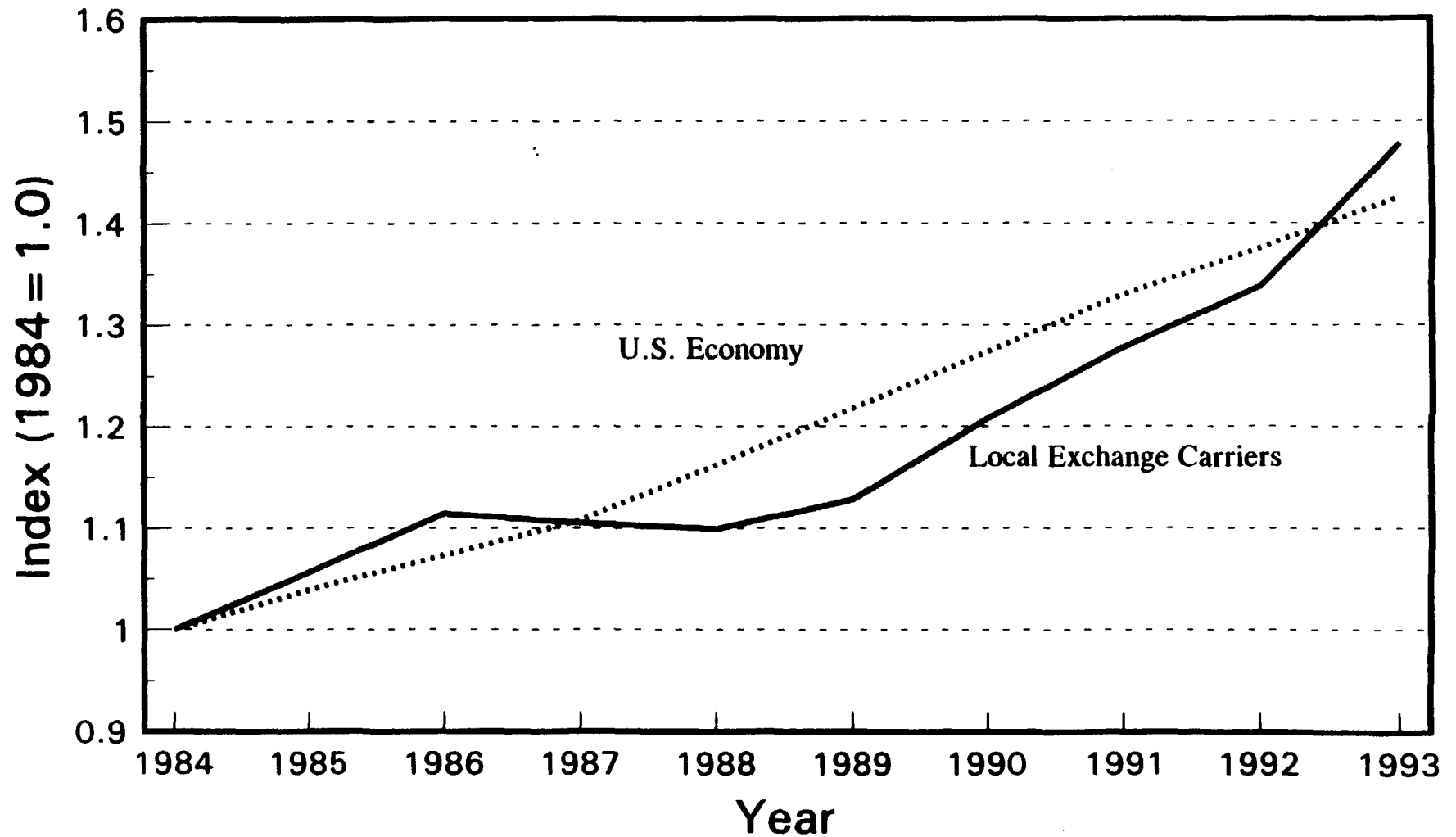
1984-1992

U.S. Bureau of Economic Analysis, Gross Domestic Product Price Index; and U.S. Bureau of Labor Statistics, Multifactor Productivity for the Private Business Sector.

Exhibit B

**Labor Price Indexes
Local Exchange Carriers and U.S. Economy**

Labor Input Price Indexes
Local Exchange Carriers and U.S. Economy
1984-1993



U.S. Economy Labor Input Price Index: Employment Cost Index, Total Compensation, Private Industry; Economic Report of the President, February 1994, Table B-46.

Local Exchange Carrier Labor Input Price Index: L. R. Christensen, P. E. Schoech, and M. E. Meitzen, "Productivity of the Local Operating Telephone Companies Subject to Price Cap Regulation, 1993 Update," Christensen Associates, January 1995.

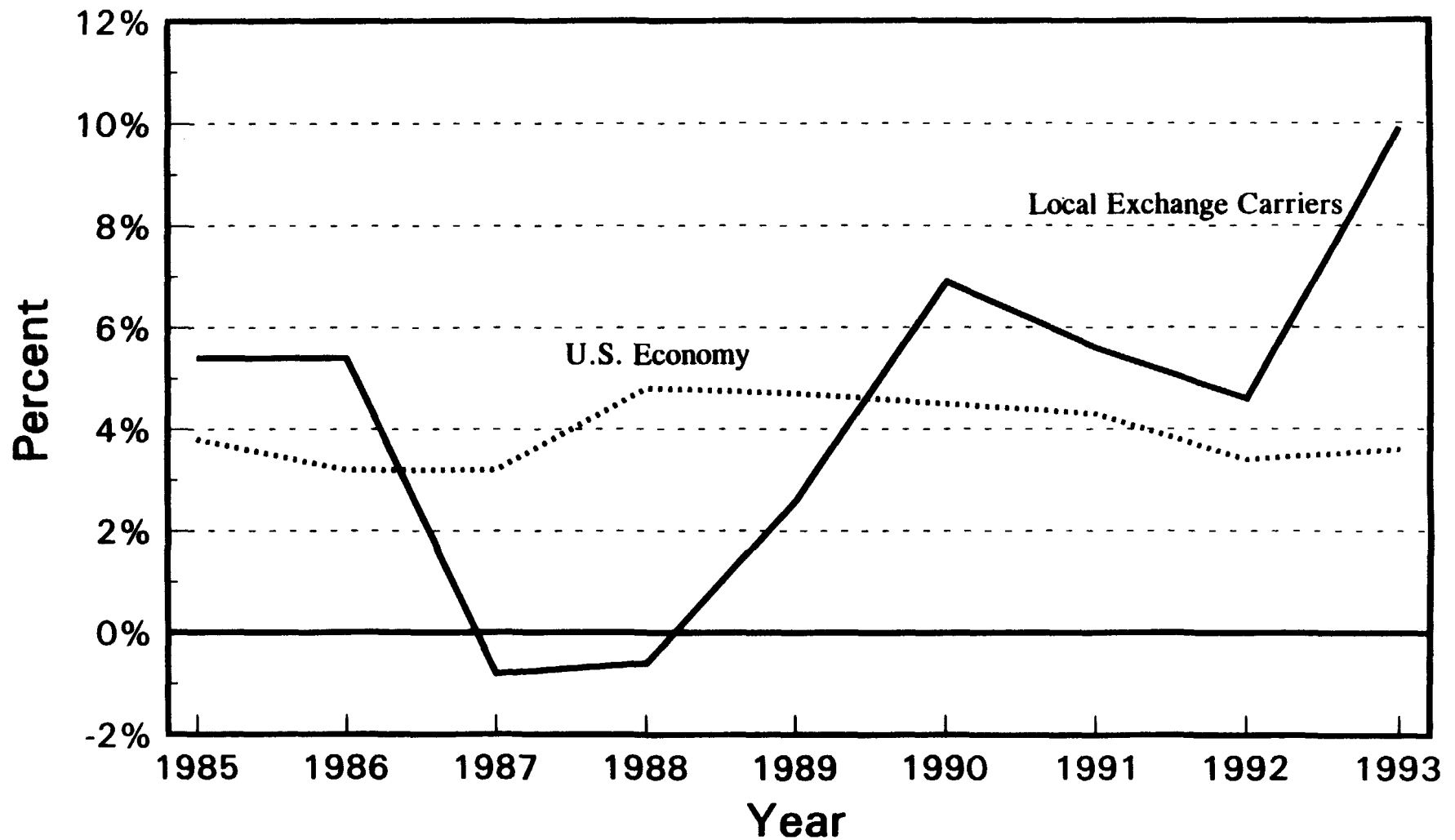
Exhibit C

**Labor Input Price Growth
Local Exchange Carriers and U.S. Economy**

Labor Input Price Growth

Local Exchange Carriers and U.S. Economy

1985-1993



U.S. Economy Labor Input Price Index: Employment Cost Index, Total Compensation, Private Industry; Economic Report of the President, February 1994, Table B-46.

Local Exchange Carrier Labor Input Price Index: L. R. Christensen, P. E. Schoech, and M. E. Meitzen, "Productivity of the Local Operating Telephone Companies Subject to Price Cap Regulation, 1993 Update," Christensen Associates, January 1995.

Exhibit D
Labor Price Indexes
Local Exchange Carriers and U.S. Economy

Labor Input Price Indexes

Local Exchange Carriers and U.S. Economy

1984-1993

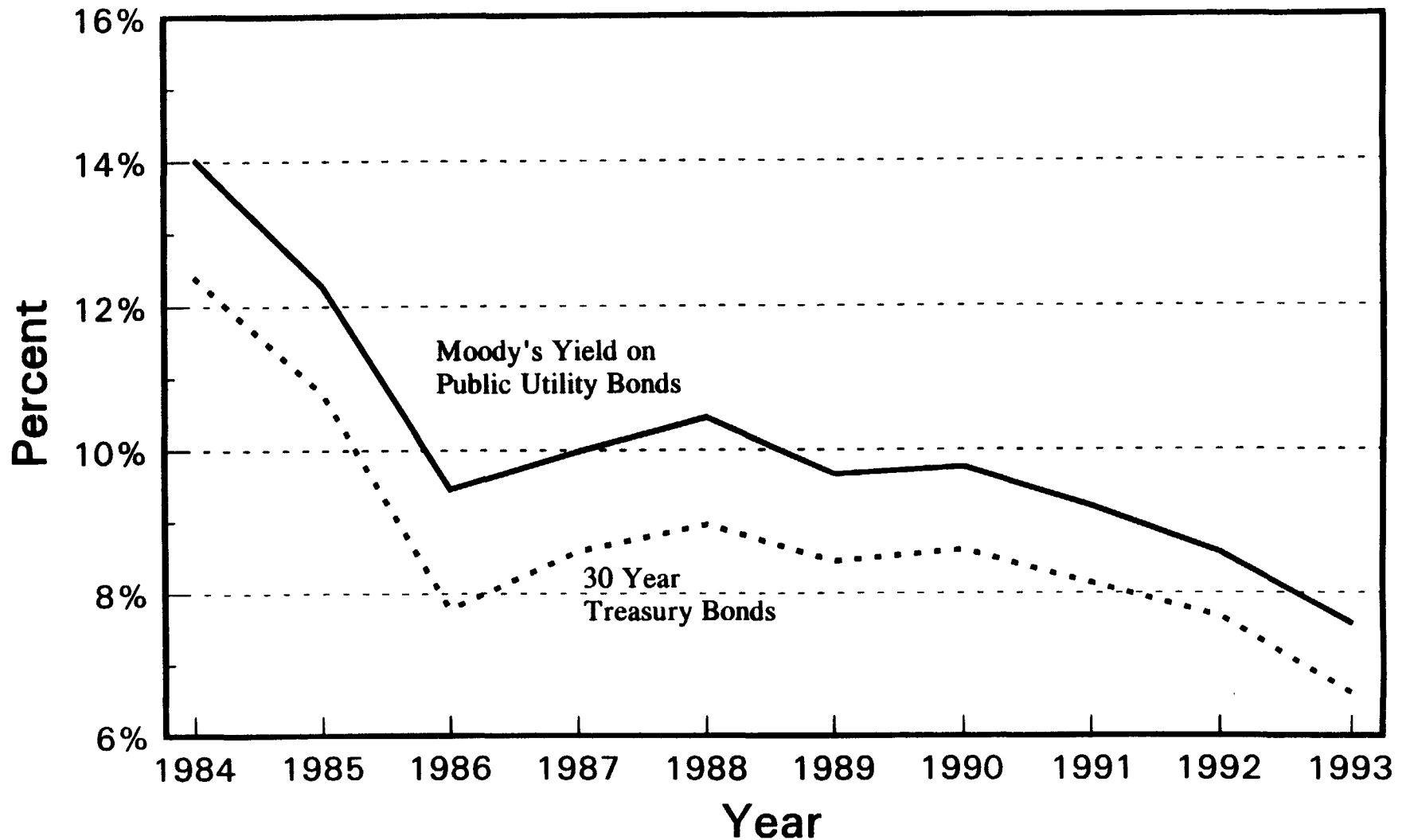
	U.S. Economy	% Change	Local Exchange Carriers	% Change
1984	1.000		1.000	
1985	1.039	3.8%	1.056	5.4%
1986	1.073	3.2%	1.114	5.4%
1987	1.108	3.2%	1.105	-0.8%
1988	1.162	4.8%	1.099	-0.6%
1989	1.218	4.7%	1.128	2.6%
1990	1.274	4.5%	1.208	6.9%
1991	1.330	4.3%	1.278	5.6%
1992	1.376	3.4%	1.338	4.6%
1993	1.426	3.6%	1.478	9.9%
Avg 85-93		3.9%		4.3%
Avg 91-93		3.8%		6.7%

U.S. Economy Labor Input Price Index: Employment Cost Index, Total Compensation, Private Industry; Economic Report of the President, February 1994, Table B-46.

Local Exchange Carrier Labor Input Price Index: L. R. Christensen, P. E. Schoech, and M. E. Meitzen, "Productivity of the Local Operating Telephone Companies Subject to Price Cap Regulation, 1993 Update," Christensen Associates, January 1995.

Exhibit E
Moody's Yield on Public Utility Bonds
and 30 Year Treasury Bond Rates

Moody's Composite Yield on Public Utility Bonds and 30 Year Treasury Bond Rates 1984-1993



**Moody's Composite Yield on Public Utility Bonds
and 30 Year Treasury Bond Rates
1984-1993**

	Moody's Yield on Public Utility Bonds	30 Year Treasury Bonds
1984	14.03 %	12.41 %
1985	12.29 %	10.79 %
1986	9.46 %	7.78 %
1987	9.98 %	8.59 %
1988	10.45 %	8.96 %
1989	9.66 %	8.45 %
1990	9.76 %	8.61 %
1991	9.21 %	8.14 %
1992	8.57 %	7.67 %
1993	7.56 %	6.59 %

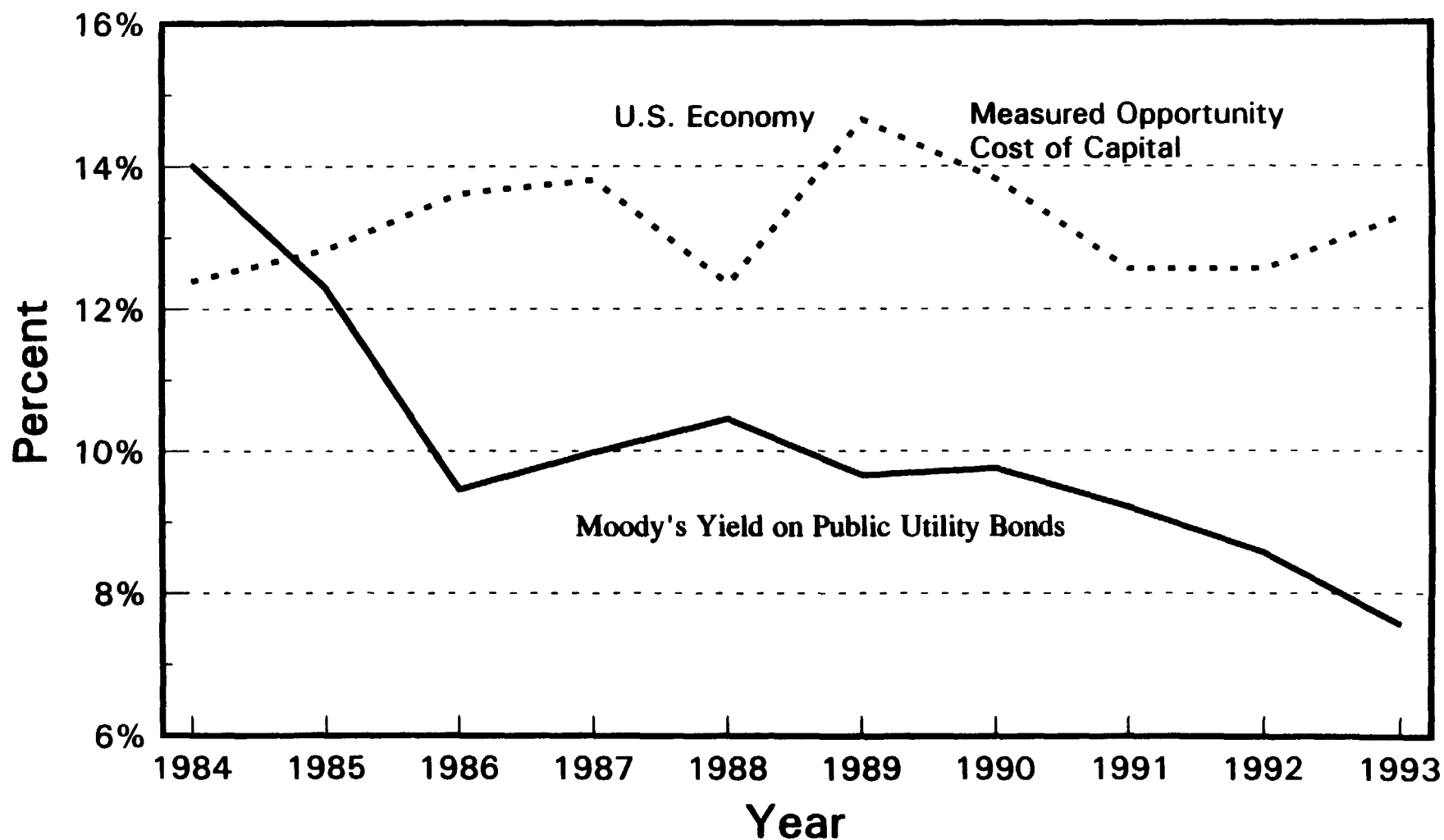
Moody's Yield on Public Utility Bonds: Moody's Public Utility Manual, various issues.

Thirty Year Treasury Bonds: Economic Report of the President, February 1994, Table B-72.

Exhibit F

**U.S. Measured Opportunity Cost of Capital
Versus Moody's Yield on Public Utility Bonds**

US Economy Measured Opportunity Cost of Capital Versus Moody's Yield on Public Utility Bonds 1984-1993



**US Economy Measured Opportunity Cost of Capital
Versus Moody's Yield on Public Utility Bonds
1984-1993**

	U.S. Economy	Moody's Yield
1984	12.39%	14.03%
1985	12.83%	12.29%
1986	13.62%	9.46%
1987	13.81%	9.98%
1988	12.35%	10.45%
1989	14.65%	9.66%
1990	13.82%	9.76%
1991	12.56%	9.21%
1992	12.56%	8.57%
1993	13.29%	7.56%

Measuring the U.S. Economy Opportunity Cost of Capital

The U.S. economy opportunity cost of capital is not a directly observable number, but it can be measured by applying two economic relationships. The first economic relationship pertains to the National Income and Products Accounts definitions of Gross Domestic Product and the total cost of inputs used by the U.S. domestic economy. In the National Income and Products Accounts, the total cost of the U.S. economy inputs is equal to Gross Domestic Product. At the economy-wide level there are two inputs: labor and capital. Therefore the total cost of capital input is equal to Gross Domestic Product less Labor Compensation. We can represent this relationship by the equation:

$$CK = GDP - CL \quad (1)$$

where CK represents the total cost of capital, GDP gross domestic product, and CL labor compensation.

The second relationship is between the total cost of capital and the components of the capital price equation. The total cost of capital is equal to the product of the quantity of capital input and the price of capital input, or:

$$CK = P_k \cdot K \quad (2)$$

where P_k represents the price of capital input and K the quantity of capital input. Furthermore, the price of capital input can be decomposed into the price index for new plant and equipment (J), the opportunity cost of capital (r), the rate of depreciation (d), the inflation rate for new plant and equipment (I), and the rate of taxation on capital (t):

$$P_k = J \cdot (r + d - I + t) \quad (3)$$

Combining (2) and (3) one obtains the relationship:

$$\begin{aligned} CK &= J \cdot (r + d - I + t) \cdot K \\ &= r \cdot J \cdot K + d \cdot J \cdot K - I \cdot J \cdot K + t \cdot J \cdot K \\ &= r \cdot VK + D - I \cdot VK + T \end{aligned} \quad (4)$$

where D represents the total cost of depreciation, T total indirect business taxes and corporate profits taxes, and VK the current cost of plant and equipment net stock. Combining (1) and (4), one can derive the following equation for the opportunity cost of capital:

$$r = (GDP - CL - D - T + I \cdot VK) / (VK) \quad (5)$$

Gross Domestic Product, labor compensation, depreciation, and taxes are reported annually in the National Income and Products Accounts. The current cost of plant

and equipment net stock and the inflation rate for plant and equipment are not reported in the National Income and Product Accounts, but are reported in a companion document published by the U.S. Bureau of Economic Analysis: Fixed Reproducible Tangible Wealth in the United States. Table 1 shows the calculation of the U.S. economy opportunity cost of capital.

Table 1
Derivation of U.S. Economy Opportunity Cost of Capital

Year	Gross Domestic Product	Labor Compensation	Depreciation	Taxes	Inflation Rate	Current Cost of Net Capital Stock	Opportunity Cost of Capital
1984	3777.2	2227.1	433.2	403.5	2.18%	6987.0	12.39%
1985	4038.7	2383.0	454.5	426.4	2.29%	7348.0	12.83%
1986	4268.6	2524.0	478.6	452.0	3.12%	7751.8	13.62%
1987	4539.9	2698.8	502.2	492.1	3.51%	8224.3	13.81%
1988	4900.4	2921.5	534.0	522.3	1.78%	8729.1	12.35%
1989	5250.8	3100.4	580.4	556.0	3.51%	9108.3	14.65%
1990	5546.1	3297.8	602.7	582.7	2.80%	9650.3	13.82%
1991	5724.8	3405.0	626.5	609.4	1.84%	10116.5	12.56%
1992	6020.2	3591.3	658.5	644.1	1.74%	10412.4	12.56%
1993	6343.3	3780.6	669.1	698.5	2.14%	10724.9	13.29%

Sources:

Gross Domestic Product: National Income and Product Accounts (NIPA), published in Survey of Current Business, Bureau of Economic Analysis, U.S. Department of Commerce, Table 1.1, line 1

Labor Compensation: NIPA 6.2, line 2

Depreciation: NIPA Table 1.9, line 5

Taxes: NIPA Table 1.9, line 9 plus Table 6.18, line 2

Inflation Rate: Based on Implicit Price of Fixed Private Capital Net Stock

Fixed Reproducible Tangible Wealth in the United States, 1925-1989, and annual updates, Tables A12 and A13.

Current Cost of Net Plant: Fixed Private Capital Net Stock, Current Cost Valuation, Fixed Reproducible Tangible Wealth in the United States, 1925-1989, and annual updates, Table A13.

Opportunity Cost of Capital: $(\text{GDP} - \text{Labor Compensation} - \text{Depreciation} - \text{Taxes} + \text{Inflation Rate} * \text{Current Cost of Net Plant}) / \text{Current Cost of Net Plant}$

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EX PARTE



United States Telephone Association

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February 9, 1995

Mr. William F. Caton
Acting Secretary
Federal Communications Commission
1919 M Street NW - Room 222
Washington, D.C. 20554

**RE: Ex Parte Filing
CC Docket No. 94-1**

Dear Mr. Caton:

Attached is a USTA paper prepared in response to the position on productivity contained in AT&T's January 31, 1995 ex parte in this docket.

An original and two copies of this ex parte notice and attachment are being filed in the Office of the Secretary on February 9, 1995. Please include this notice and attached material in the public record of these proceedings.

Respectfully submitted,

A handwritten signature in cursive script that reads "Mary McDermott".

Mary McDermott
Vice President, Legal & Regulatory Affairs

cc: Kathleen Wallman
Richard Metzger
Michael Katz
David Nall
Mark Uretsky
Anthony Bush
Alexander Belinfante

AT&T's APPROACH TO PRODUCTIVITY IS INCORRECT

In 1989, the FCC accurately explained productivity as follows:

"Productivity advances in a firm or industry are manifested in increased output from the same amount of factors of production, or equivalently, the same amount of output from decreased levels of factor utilization. In either case, the dollar cost of a unit of output declines due to the diminished factor requirement per unit of output. Of course, if some or all factor prices are rising at the same time, those price rises will at least partially offset the reductions that would flow from improved productivity by itself. Nonetheless, the net price effect of productivity and any such factor price increases would continue to be less than the factor cost changes in isolation."¹

The FCC determined in the 1989 price cap order that the Christensen Total Factor Productivity Methodology was an appropriate way to measure productivity.² Indeed, it was this methodology that the Commission relied on in setting the productivity offset for AT&T. The Interstate Commerce Commission uses the Christensen methodology in its price cap plan for the railroad industry.

At the outset of this proceeding, USTA employed Christensen Associates to calculate the productivity offset for the price cap LECs using TFP. TFP is the ratio of total output to total input, where output includes all services provided by the LECs and total input includes the capital, labor, and materials used to provide those services. Christensen's methodology directly measures output and input. Therefore, it is a direct measure of TFP. Christensen's methodology is not dependent on arbitrary cost allocations, such as depreciation and separations. Nor is it subject to arbitrary productivity adjustments such as the 50/50 formula for common line. Christensen's methodology measures the actual experienced productivity, including all sources of scope and scale.

Even though AT&T has supported the Christensen methodology for

¹ Report and Order and Second Further Notice of Proposed Rulemaking, CC Docket No. 87-313, 4 FCC Rd 2873 at Para. 198 (1989).

² Id. at Para. 225 and n. 504 and see generally id. at Para. 198-239.